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U.S. FOREIGN ASSISTANCE TO AGRICULTURE: A PROPOSED REDIRECTION

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By Ray W. Nightingale, Francis S. Urban, and Charles E. Hanrahan. International Economics Division. Economic Research Service, U.S. Department of Agriculture. ERS Staff Report No. AGES820514, May 1982.

ABSTRACT

Changing attitudes towards international assistance and decreased development financing necessitate new programming approaches to insure effective utilization of limited resources. Falling world food production growth rates in the face of increasing demand, and increased stress on natural resources, make the acceleration of technological improvements a critical factor in maintaining and increasing the availability of food supplies in both food deficit and food surplus countries. The United States has historically demonstrated an ability to strengthen institutional capacity for agricultural research and extension in other countries. However, this requires continuity and stability in bilateral support. Renewal of efforts in this direction will yield long-term benefit for the United States in agricultural trade, resource conservation, and domestic food costs.

KEYWORDS: Development assistance, agricultural policy, research-extension, technology change, resource use.

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PREFACE

The initial draft of this report grew out of a request by the Board for International Food and Agricultural Development (BIFAD) for recommended new initiatives in bilateral assistance to agriculture in developing countries. Underlying this expanded version of the earlier report are the broader issues of financial and natural resource constraints to increasing global agricultural production. Central to the issue is the question of the tradeoff between expanding the use of natural resources (land and water) and increasing their productivity in order to increase global food production. Thus, this report also reflects some background work on the issue of resource productivity and resource - technology tradeoffs. It focuses on the role of agricultural research in the developing nations to achieve higher levels of food production and thus a greater degree of global food security. While "hard" conclusions and recommendations must await rigorous analysis, the material presented here implies that more emphasis should be given to increasing agricultural research capacities in the developing countries, and that the United States should invest much more of its limited development assistance monies in this area.

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INTRODUCTION

Attitudes in developed countries towards development assistance are changing and levels of financing for that assistance are decreasing. The United States Agency for International Development (AID) has long had a problem maintaining sustained support for its programs. Until recently, it was possible to bring newly identified development opportunities to the attention of the Congress and to gain approval of at least some new initiatives. In Fiscal Year 1980 and 1981, however, AID programs were funded by continuing resolutions. The Congress was not willing, or able, to provide a hearing. This was particularly unfortunate because recent rapidly changing economic circumstances have dictated a need for change in program objectives and purposes. For 1982, Congress increased development assistance by $96 million. However, the largest share of increased foreign assistance will go to economic support funds not dedicated to development support, and to security assistance. The underlying cause of declining support is a growing public and Congressional perception that foreign aid activities are not cost-effective.

Hesitancy in foreign aid has been greatly reinforced by the massive transfer of financial resources from the developed countries to a small group of petroleum exporters. This caused the non-petroleum exporting countries of the Third World to accumulate crippling foreign account deficits and debt burdens which divert financial resources from agricultural capital investment. The reaction of governments has been

to raise their demands on the industrialized nations for favored treatment while exercising caution in their dealings with petroleum suppliers. This attitude has aggravated public dismay in the west with the pace and direction of economic progress in developing countries, their exploding populations, continued political instability, and growing hostility in international fora towards "rich" countries.

These attitudes are accompanied by a financial crisis in both the rich and the poor countries. For the developing countries, rising energy prices have meant severely curtailed ability to finance development efforts. The developed industrial countries, with aging populations, have to cope with an increasingly burdensome domestic welfare bill and huge new investments in restructuring their industries to adapt them to the new energy situation, while concurrently paying high petroleum import bills.

Whatever the perceived rights and wrongs of the situation, the basic fact remains that development funds are likely to be scarce while assistance needs of developing countries will continue to increase. This is because of the long-term slowing down in per capita food production growth in the world, and particularly in most developing countries, while demand continues to increase. In many African and some South Asia countries, per capita food production is actually declining. There are also increased inter-annual production

fluctuations, steeply increasing resource use costs and balance of payments difficulties of energy importers (3, 15, and 21). 1/

In this report we focus on the developing country assistance needs most directly related to agricultural production improvement programs and recent trends in U.S. assistance programs, and make recommendations for increasing the overall effectiveness of limited development assistance funds.

In view of this, the authors review and evaluate the current and prospective state of agriculture worldwide, food demand and assistance needs in developing countries, the means and institutions available in the United States and elsewhere to extend technical assistance, and make recommendations regarding the appropriate course of immediate action.

WORLD FOOD AND AGRICULTURE PROSPECTS

The need of developing countries for food assistance is on the increase and becoming critical. This is because in many countries population growth outstrips food production gains and because the high cost of energy imports sap their ability to import food. However, the capacity of donor countries to extend food aid is becoming more constrained by leveling of food production gains, growing pressure on their natural resources, and the low level of world grain reserves.

1/ Underscored numbers in parentheses refer to items in the References section.

Growth in World Food Demand

The present and likely future world food situation poses a serious threat to poor countries' economic development prospects. Their demand for food has outpaced increases in production so that food imports absorb increasing amounts of resources. Record-breaking increases in population, rising incomes, and declining real prices combined over most of the last three decades to expand foreign demand for agricultural products at a 2.9 percent rate, more than double the rate of the first half of the century (15).

World population increased by over 1.9 billion people during the three decades from 1950 to 1980, with developing countries accounting for 84 percent of this increase and developed countries, 16 percent. Growth in the number of people to be fed accounted for about half of the period's increase in demand. Income increases accounted for an additional 1-percent increase in per capita demand per year, with a large share directed toward livestock products. In the eighties, worldwide demand for agricultural products is likely to expand at a near-record rate of 2.5 to 2.7 percent annually. With growth rates of this magnitude, absolute increases in the demand for agricultural products in the eighties would be nearly one and a half times greater than during the past decade. Developing countries will account for most of this demand, but their prospects for concurrent production growth are not promising.

World Food Production Gains Level Off

World agricultural production during the postwar period expanded at a 2.5 percent annual rate, more than double the rate of the previous half century. A number of different factors combined to sustain this rate. Chief among these were growth in the resources allocated to food production, productivity gains, and what appears in retrospect to have been abnormally favorable weather. For the postwar period as a whole, over one-third of the gain in world food production was due to expansion of arable land committed to production. Expansion was most pronounced in the fifties and sixties, as new lands were opened up, and again in the middle seventies as the United States returned large acreage reserves to cultivation. But the remaining two-thirds of the world's postwar gains were the result of productivity increases due largely to improved farming practices and wider use of yield-enhancing inputs such as fertilizer, pesticides, and improved plant varieties. As with area expansion, the strongest productivity gains were in the fifties and sixties. While the wider weather fluctuations of the seventies make it difficult to assess recent yield gains, productivity growth appears to have slowed over much of this period.

Both the International Maize and Wheat Improvement Center (CIMMYT) in Mexico, and the International Rice Research Institute (IRRI) in

the Philippines, have encountered yield ceilings in their experimental work. Some cereal breeders believe we may be approaching the end of the epoch of significant yield gains in wheat as a result of research and that during the 1980's yield increases are likely to reach a plateau. Other breeders, however, anticipate breakthroughs in plant tolerance to stress or unfavorable growing conditions and other advances in genetic engineering that will boost productivity (7). If so, it is in the developing countries, where yields are far below experimental levels and where the potential for regionally specific plant research is high, that such plant science breakthroughs are likely to bring most rapidly increased food production.

If developing countries are forced to expand cultivation into increasingly marginal areas, interannual fluctuation in yields and, in turn, supply and import demand are likely to widen significantly. Sharper swings were already evident in foreign grain and oilseeds production in the seventies. During the middle and late seventies there was a marked increase in trade, a disproportionally large share of which was supplied by the United States. This transmitted foreign production instability into U.S. farm price fluctuations (15).

Global Pressure on Natural Resources

Land, water, fossil fuels and fuelwood resources are rapidly being depleted worldwide. About 1.5 billion hectares of land are presently cropped in the world. The total potential arable land is variously estimated at 2.5 to 3.7 billion hectares (8). In the next 20 years, arable land is expected to increase by

only 4 percent. However, the best land is already under cultivation and bringing new lands into cultivation will require huge investments. Moreover, the new land is usually not in those countries where the greatest population pressures exist (8).

By the year 2000, population growth alone will have caused requirements for water to be double 1970 requirements in nearly half the world (6). In many developing countries water supplies are likely to become increasingly erratic by the year 2000 as a result of extensive deforestation. Development of new water supplies will become more costly virtually everywhere. Water scarcity is a serious problem on the U.S. high plains and elsewhere. The Indian subcontinent, North Africa, the Middle East, the Moslem republics of the USSR, and Australia are all experiencing increasing pressure on water resources.

New lands and new water depend on energy, but energy in its convenient liquid form may be in short supply and subject to price pressures. Most of the elements that have contributed to higher yields--fertilizer, pesticides, power for irrigation, and fuel for machinery--depend heavily on petroleum and natural gas. During the 1990's, world petroleum and gas production may peak while their prices are expected to double in real terms. For the one-quarter of the world's population that depends primarily on wood for fuel, the outlook is even bleaker. Needs for fuelwood may exceed available supplies by about 25 percent before the turn

of the century, and they will have to compete on the world market for increasingly scarce and costly hydrocarbon fuels (6).

Declining Food Reserves

Several factors combined in the 1960's and 1970's to reduce anxiety about the adequacy of world food supplies. The United States and other major producers accumulated large stocks of food and feed grains. The "Green Revolution" produced large gains in food production in some of the world's most populous countries. By the early 1970's world food intake had increased to 108 percent of the FAO published minimum per capita requirements. This compared with about 104 percent in the 1960's and slightly below 100 percent in the 1950's (15). During this period widespread evidence of continued malnutrition among low income groups in developing countries caused some donor institutions to direct increasing amounts of assistance funds to bring about a more equitable distribution of economic development gains.

It is now evident, however, that there has been a decrease in grain reserves during a period of usually good worldwide growing weather. In fact, grain stocks as a percentage of utilization declined from 20 percent in the sixties to 12 percent in 1981 (21). Food imports are up sharply in Asian nations, which have been rapidly increasing production, as

well as in African nations where production has actually declined.

USDA studies indicate that world grain stocks declined from over 20 percent of utilization in the 1960's to just above 12 percent in the 1970's.

THE CRITICAL ROLE OF AGRICULTURAL RESEARCH AND TECHNOLOGY

In the face of growing natural resource and financial assistance constraints the only effective approach to utilization of reduced resources is to increase food production through: (1) the development of technologies appropriate for the LDC's resource, infrastructural and social constraints, and (2) the development and implementation of appropriate economic policies to provide incentives for adoption of these technologies. This requires development of indigenous research organization supported through close links with international research organizations.

Technical Change and Agricultural Development

As growing global food demand presses on agricultural production capacity, additional resources must be drawn into use. But the decreasing availability and increased cost of natural resources such as land, water and energy makes the world's future food supply ever more dependent on continuous advances in agricultural technology. The agricultural production technology developed for regions having the best soil and water, and the most favorable climatic and geographic conditions, may not be suited to production on more marginal lands.

All nations, agriculturally rich and agriculturally poor, have a common interest in the development of technology which will get the most product out of the world's next best resources. This will permit avoidance of reduced returns to investment and the instability that goes with production on ever more marginal lands (16).

Vernon W. Ruttan emphasizes the significance of technical change for agricultural and for economic development: (1) it permits the substitution of knowledge for physical resources, (2) it facilitates the substitution of less expensive and more abundant resources for more expensive and increasingly scarce resources and (3) it releases the constraints on growth imposed by inelastic resource systems (18).

Agricultural technology, however, is often very site specific. It is a function of climate, soil, terrain, energy availability and reserves, plant and animal diseases, labor availability and cost, level of farmer skills, and irrigation and transportation infrastructure. Not only do all of these attributes of agriculture vary among countries, but they also vary among the many ecological regions within individual countries. These differences in agricultural production resources and economic opportunities prescribe a high degree of diversity in technologies to increase productivity and food output.

Economic growth ultimately depends on the flexibility and efficiency of each society in transforming itself in response to technical and economic opportunities. Farmers in traditional agriculture are

poor not because they are irrational or incompetent but because they have few opportunities to improve their situation. Appropriate economic policies and institutions, and agricultural research designed to produce and continuously improve an economically viable and ecologically adaptable technology represents a critical link in agricultural development in many of the developing countries. But the technology and its link to the farmer must, in many cases, be tailored specifically for each country and even for each region within the country. Insufficient investment in development of location-specific agricultural technologies was a major reason for the lack of effectiveness of much of the technical assistance effort of national and international agencies during the 1950's and 1960's.

Technological innovation in today's agriculturally advanced countries did not occur in a social and institutional vacuum, nor will it do so in the developing countries. Developing countries need to establish the institutional basis and the technical capacity for advancing agriculture. Correspondingly these countries need to develop the capacity for social and economic analysis and for policymaking so as to ensure economically sound agricultural research programs, and the incentives for adopting new technologies. Increased production is accomplished through a carefully structured set of research and extension organizations linking the researcher to the farm community. Both economic policies and extension services must be frequently reviewed to ascertain their effectiveness in advancing agriculture on a broad front.

Agricultural Research in Developing Counties

The experience of the world's most advanced market economies emphatically demonstrates the need for public sector investment in education in the biological and social sciences related to agriculture, in experiment station research capacity and in agricultural extension. The developing nations must also make this scientific and educational investment, design appropriate institutions and policies to successfully test and diffuse the indigenous technology required by their own farmers, transfer and adapt the agricultural technology developed in other countries, and conduct the basic and applied research necessary to provide farmers with a continuous stream of new biological, chemical, and mechanical innovations.

Efforts to achieve agricultural development by the direct transfer of foreign technology have been largely unsuccessful. Modern agricultural technology has evolved largely in the developed countries of the temperate zone, and is primarily adapted to their ecology and factor endowments. While agricultural research and education assistance was building a solid base for the future, early extension projects were designed primarily to transfer materials and practices from the developed to the less developed countries and to implement multi-purpose and frequently superficial community development efforts, an activity that has recently resurfaced as integrated rural development. In reviewing the agricultural efforts of the 1950's and early 1960's, T. W. Schultz points out that extension

services developed by donor and host countries soon faded away because there was little worthwhile technical information for them to distribute to farmers.(19)

The organization of commodity production programs based on sound scientific principles and improved technology has been shown to be effective. Stimulation of agricultural output and increases in incomes of large numbers of people clearly can also be fostered through concerted efforts to develop farming systems. There is a general need to overhaul government services which support accelerated agricultural development. Most national research agencies were established when the urgency of action was not so apparent as today. In the Philippines, the required renovation of government services was implemented by the IRRI. Such centers do not have the means to do this worldwide, and national governments will need external assistance.

The experience of India with high-yielding varieties demonstrates the importance and the feasibility of achieving the national research capability essential to adoption of new technology. The Indian experience also demonstrates the need for broad national research and technology capacity to ensure against regional disparity in economic benefits. As new grain varieties entered Indian production, productivity growth rates moved from 2.5 to 20.0 percent in the wheat growing states. In the mid-fifties the three states with the

lowest growth in productivity averaged -1.9 percent; the three highest, 2.3 percent. By the late sixties, these growth rates were -1.6 and 14.1 percent, respectively. In the wheat growing states national research centers collaborated with specialized international centers to develop locally appropriate new technology.(22) Dryland areas of India and areas ecologically suited to other crops will require more decentralized national research systems than have so far been established. A significant portion of interstate disparities in the growth of Indian agricultural productivity are explained by research investment at the State level. It has been estimated that additional investment in State sponsored research and extension systems would yield an annual return of 40 percent.(10)

Soundness of investment is not the sole argument for agricultural research and certainly not the most urgent. The high cost of failure to achieve rapid productivity growth, particularly rapid growth in output per hectare in the densely populated poor countries, cannot be overemphasized. Unless output per hectare in these countries can be increased at least as fast as demand, there is no possibility of simultaneously meeting the subsistence needs of expanding rural and urban population.

In recent years, advocates of rural development have implied a conflict between productivity growth and the welfare of rural

communities. However, the problem of welfare in the rural areas in most developing countries remains more a problem of the level of output per person than of distribution. One cannot approach the problem of distribution without first addressing the problem of production.(19)

International Research Links

In the last 25 or 30 years there began to emerge what some call a "three-tiered" system of agricultural research (23). One tier consists of national programs, large or small, in each country. A second consists of the international or regional research installations in the tropics or subtropics which backstop the national efforts and provide some linkage to centers of specialization elsewhere. The third tier consists of the centers of specialization in the developed countries for the most part, where advances through basic and supporting categories of research are generated.

While there are problems in effectively linking regional international research with advanced countries research systems, this does not require institution building. It is at the developing nation level that institution building is essential so that successful programs of the International Agricultural Research Centers and other regional research centers can be complemented by effective national agricultural research and development activity.

Returns on Investment in Agricultural Research and Extension

All analyses made of investment in agricultural research estimate rates of return well above rates realized on more conventional investments. Studies made of specific research programs in Latin America and Asia clearly establish that research programs in developing countries can be highly productive. Internal rates of return estimated for developing countries are generally higher than for developed countries. For example, returns to research on cotton in Brazil and on wheat in Mexico are estimated at 77 and 90 percent, respectively. The return to research on hybrid corn in the United States is 35 to 40 percent (9).

The failure of developing countries to invest more heavily in agricultural research is not out of ignorance of prospective benefits. Agricultural research, which so rapidly advanced agriculture in the United States and Japan, came about as agricultural research constituency groups came into existence. Such groups are unlikely to emerge spontaneously until a core of medium-sized farming entrepreneurs, are established who can influence public policy and research expenditures. Generally such groups are rare in developing countries. U.S. development assistance in the vital area of agricultural research institution building can establish the foundations of critical technical capability in countries with agricultural growth potential decades ahead of what would otherwise be possible.

IV. BUILDING AGRICULTURAL RESEARCH AND DEVELOPMENT CAPACITY IN DEVELOPING COUNTRIES

In the final analysis, a sustained growth in developing country agriculture depends heavily on implanting a permanent indigenous innovation machinery. This means appropriate economic policies and stable institutions supporting local research scientists and a closely linked core of technical people serving farmers. To assist in the development of such institutions, AID programs must be a stabilizing element rather than destabilizing and thus must be free of shifting short-term political objectives.

Support for Research Scientists

During the last two decades many university graduates of developing nations around the world have been trained in the agricultural sciences in leading U.S. and European institutions. Many of these people are now serving their countries as researchers, teachers, and administrators of programs in service of agriculture. Unfortunately many people have not been able to do the important research for which they trained and have moved prematurely into administrative and leadership positions, forever losing the opportunity to employ their critically important scientific and technical skills. Others have returned only briefly to their homes or have never returned, instead assuming positions in the developed countries. The reasons for this are numerous, but for many

individuals with scientific training there is too little present or perceived future opportunity to be working scientists in their own countries.

The talented individual in a field of science must be provided with the opportunity to make the contributions to science and technology which he or she is confident of accomplishing, otherwise that talent will be lost. The institutional setting for such opportunity is unfortunately all too often lacking. Where this has been provided, as in India, the results have been most rewarding.

Adequately staffed research laboratories and crop or livestock experiment stations are in no way a guarantee of a developed agricultural sector. This system must reward scientists for their familiarity and ability to deal with agricultural problems. Otherwise researchers can be expected to look excessively to international recognition and reward. While some industries in market economies will search out and acquire the needed scientific knowledge and skills, this is not the case with agriculture in the developing countries, particularly in countries where many small farmers produce the bulk of food staples. But it is critically important that national agricultural research be one element in the network of research, education, and extension institutions closely linking scientists to farming communities.

Financing and Managing Agricultural Research

Currently, there is no agricultural research system in the Third World that is comparable in research facilities and scientific staff to those in any of the major advanced agricultural countries. This is true in spite of the fact that 75 percent of the world's population lives in developing countries. Even in middle income countries having fairly long established research institutes, there is inadequate means to keep abreast of advances in the biological sciences, laboratory and field methods, and equipment.

The status of agricultural research in the developing countries reflects the extremely low overall level of investment in research and development relative to that in high income countries. Only four percent of global research and development expenditures takes place in developing countries. Only one percent of global research and development expenditures in health, agriculture, housing, and industrial technology is in developing countries.(11) With such a disparity it is obvious that no public expenditure within the financial capacity of LDC's can halt the growing technology gap without a great deal of technical assistance from developed countries. As prospects for international assistance are poor, aid to agricultural research must be conducted so as to encourage, not discourage the international flow of private investment.

But both international firms and national private industry must be encouraged to support research on domestic consumption as well as export crops.

Many present deficiencies must be corrected in order to bring about the needed new and vigorous thrust in developing agricultural research capabilities in low and medium income countries. These include promoting effective links between research organization, extension services, and the farming community; determining research priorities; designing necessary organizational and institutional arrangements for carrying out research programs and projects; identifying sources of finance for research programs and projects; determining the facilities required to conduct research; and many others.(5)

Supporting a National Research Capacity

A stable national research establishment is essential to acquisition and adaptation of advanced national and international research centers' output. Building national research institutions is difficult and takes time. Further, fledgling research organizations need sustained support so that scientists and technicians may maintain and improve their skills and understanding and have access to newly developed tools, techniques and research materials. Even the most applied

research takes time, requires sustained effort, and benefits from links with the international research network. Erratic assistance to agricultural research runs a high risk of being wasted. It does not require large volumes of assistance to greatly enhance the quality of national research and technology development, but it does require stable assistance. It is thus urgently important to make a maximum effort to insulate this facet of U.S. international cooperation from the programs of commodity and financial assistance which are essential to the conduct of day-to-day international diplomacy. The global food problem has become too critical for short-term manipulation. Enduring bilateral agricultural development programs have the potential to generate goodwill overshadowing the shifting moods of transient political expediency.

Similarly, national education capacity is needed to provide scientific manpower for establishment and maintenance of a critical mass for research. Very few developing countries have at present educational institutions with sufficient capacity to provide scientific manpower for the establishment and maintenance of a critical mass of researchers. Most of the scientists must still be trained in developing countries. It is essential to gradually expand the scientific training capacity at the national level to supply a

sufficient number of scientists and extension personnel. This effort must be sustained and long-range, free from the vagaries of budget appropriations and political climate in donor countries.

AID Policy and Role

While the Agency for International Development has repeatedly acknowledged the importance of agricultural research, according to T. W. Schultz, it is "inefficient in providing funds to help build national agricultural research experiment stations and laboratories in low income countries "(19). Nonetheless, the 1978 Agricultural Development Policy Paper again reaffirms AID's commitment to research support and identifies three types of agriculture research-related projects: (a) contract projects with U.S. institutions, (b) contributions to multilateral support of agricultural research centers, and (c) support of low income countries' national programs. The greatest need identified by AID, in 1978, was to strengthen LDC nationwide adaptive research systems, including local research stations and extension service. Proposed support included financing physical construction and equipment as well as training and technical assistance, while focusing research on needs of low-income farmers--the crops, livestock and fish they grow, or potentially might grow and profitably market; the constraints they face and farming systems they employ;

and the kinds of inputs and implements within their reach. Research was proposed on farming systems of agricultural producers and the relationship between new technology, production, equity, social organization--including the roles of individual and collective incentives, and the ecological impact of new technology (1).

The Agricultural Development Policy Paper expressed concern that direct AID support for national research systems might be constrained by availability of qualified professional staff in the agency. This concern proved to be well founded. A late 1980 report titled A Strategy for Focusing AID's Anti-Hunger Efforts (2) prepared by the AID Technical Program Committee for Agriculture (TPCA) in response to the Report of the Presidential Commission on World Hunger of 1978 (17) states that 13 missions now have no agriculture officers; there are at least five contractors for every field staff person; 45 agriculture officers have retired in the last 3 years and 30 of the 244 foreign service positions in agriculture are vacant. With $300 million in assistance to irrigation, AID has only 6 professional irrigation positions. The TPCA report notes two observations made in the USDA response to the World Hunger Commission Report: (1) AID does not have the number and quality of agriculture and rural development staff to make reliable final approval judgments in regard to rural development projects;

(2) under the circumstances, these judgments should continue to be a USDA/AID-shared responsibility so as to utilize the joint professional expertise in the agencies.

THE U.S. ADVANTAGE IN AGRICULTURAL DEVELOPMENT ASSISTANCE

Many advanced countries have instituted effective foreign assistance programs. The United States may be best situated, because of its history and institutions, to help the developing countries establish agricultural research and extension systems.

The USDA-Land Grant System

Over the last three decades many advanced countries have extended agricultural development assistance to low income countries. Among these are Canada, Great Britain, France, Belgium, and the Netherlands. However, the United States has had the largest and broadest involvement in terms of personnel numbers, the scope of natively based technology development and transfer, and the number of private and government institutions involved.

The obvious reason for this is the success and adaptability of the peculiarly American institution that was built and adapted to foster economic and scientific development in agriculture, the USDA-land grant system, based on direct links among the U.S. Department of Agriculture, Land-Grant Universities, and State experiment stations. This system has proved tremendously successful in making American agri-

culture the most scientifically advanced and productive in the world. It brought similar benefits where it was transplanted and adopted, notably in Canada and Japan.

Over the last 30 years a large number of foreign technical and scientific personnel have been trained in the USDA-land grant system, which itself has adapted to meet their needs. Also, a large number of scientific and technical personnel responded to the needs of newly developing countries, training, consulting, designing, and managing agricultural research and training facilities in the developing countries. Many of them have direct and prolonged experience in service abroad.

The USDA-land grant system is large and flexible, based on government, universities, and experiment stations that can rapidly train and expand the number of experts available for international agricultural development assistance. However, efforts must be made to sustain the capability of the system by maintaining the pool of experts available for service abroad. This is particularly important during the period of sharp budget cutting exercises. Short-term expediency may often constrain our future and flexibility in international relations.

The scientific establishment in the system is spread over a wide geographic area of the country. While most of the

work and resulting scientific advancements occur in temperate zones of the country, a large and increasing part of it is carried out in warm and subtropical zones--Florida, California, Hawaii, and Puerto Rico. Increasingly, U.S. scientists participate in cooperative and exchange arrangements in research on tropical zones and tropical plants. Thus, rapid advancements in biological and other sciences in the United States provide a broad foundation for geographically targeted research breakthroughs.

A Mutual Interest in Agricultural Research

Because of our extensive involvement abroad over a prolonged period of time, numerous institution-to-institution and scientist-to-scientist linkages are in place and the potential exists to use them to expand collaboration with the developing nations. This will not only improve U.S. relationships with the Third World but also bring direct benefits to scientific advancement in the United States. Such problems as severe erosion on dry lands in North Africa or large-scale deforestation conditions on the Saharan Atlas High Plateau are being experienced elsewhere, including the United States, though not yet on such a scale. In large parts of the Third World, water is the resource limiting greater food production. As urban and industrial needs grow, the industrialized and the developing countries will share in the search for water conserving agricultural technology and farming systems.

Complementarities with International Assistance Institutions

U.S. assistance to agriculture in low income countries, if based on agricultural research, development of technology, and institution building, would be highly complementary to the program of the World Bank and the regional development banks which are oriented towards investments in capital intensive and infrastructure projects such as transportation, irrigation, and processing. By instituting closer consultation between AID and the World Bank and regional development banks, complementarities can be achieved which will increase the return to U.S. investment in both bilateral and multilateral assistance.

U.S. DEVELOPMENT ASSISTANCE FUNDING

In spite of the apparent urgency, real levels of U.S. development assistance have declined and may continue to decline. U.S. bilateral development assistance is at the same level today as it was over 15 years ago. The appropriated development assistance in 1981 was $1.67 billion, or one-third of the $4.98 billion total appropriations for International Security and Development Cooperation (formerly the Foreign Aid appropriation). The total appropriation includes $665 million for military assistance, $2.06 billion for the economic support fund (largely Egypt and Israel), and $580 million for the Peace Corps, other activities, and operating costs. In 1978 and 1979, $1.9 billion was obligated in development assistance funds, only $200 million more than in 1964. Development

assistance obligations were below $1 billion in 7 of the last 15 years, dropping to the lowest point of $625 million in 1974 (14).

In an era of rapid inflation, the nominal value of aid is a poor measure of capacity to carry out development assistance. In real terms, development assistance has been below $800 million since 1971 and dipped to $357 million in 1974. 2/ (Fig. A). Although assistance funding has declined, during the last 10 years both the range of activities conducted and the number of participating countries has expanded rapidly with the placement of increasing emphasis on meeting basic human needs at the village level in the poorer countries.

In commenting on the state of U.S. foreign assistance, John Mellor observes that expenditure has been increasing for things that consume tremendous amounts of recurrent expenditure on the contributions side from the receiving country. This puts their own budgets in great difficulty, and also consumes a great number of trained people in the receiving countries. He finds that all the direct poverty-oriented programs are incredibly labor-intensive with respect to highly trained people (13).

2/ AID funding data adjusted for price changes by the World Bank Index of International Inflation. The base year is 1970.

Figure A: Real Value of U.S. Programmed Development Assistance
(billions of dollars at 1970 prices)

Based on AID/OFM Expenditure data adjusted for price change by the IBRD Index of International Inflation

Source: The Changing Content of U.S. Agricultural and Rural Development Assistance, Ray W. Nightingale, IED Working Paper, 1981

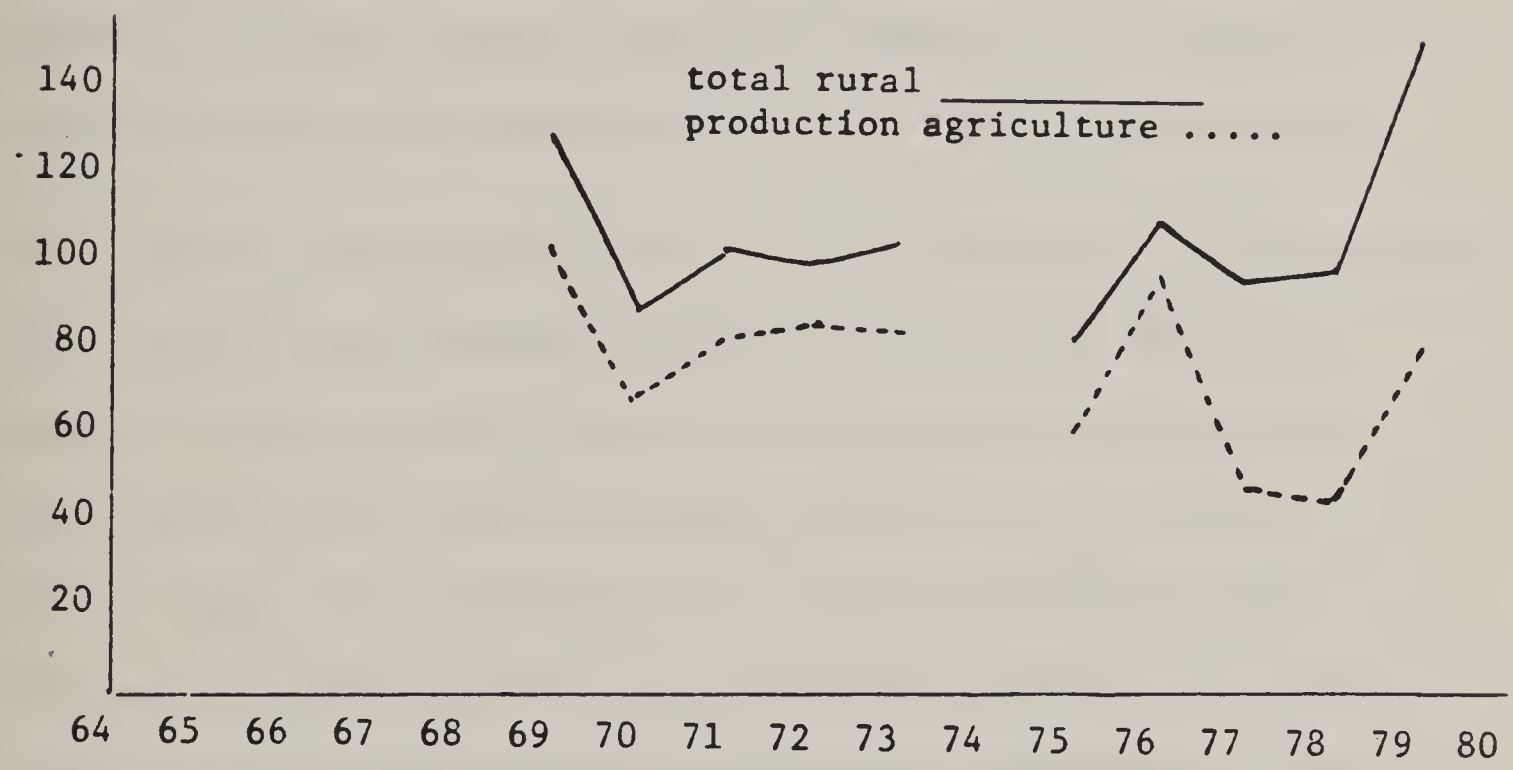
In spite of the increased urgency of the world food situation the share of total development assistance going to agricultural production programs increased from 16 percent in 1969/73 to only 19 percent in 1975/79. The value in 1970 dollars of assistance expenditures to agricultural production declined from a 1969-73 annual average of $85 million to a 1975-79 annual average of $65 million, though the corresponding real value of overall rural assistance increased by $4 million (Fig. B).

While many relatively advanced middle income countries in Latin America no longer receive development assistance, numerous African states have been added. The number of AID assisted countries in Africa grew from 10 in 1976 to 27 in 1980, but the real value of development assistance to these countries has dropped from an average of $695 million in 1970-74 to $591 million during 1975-79.

Use of food aid under P.L. 480 has added to resources for development, but if only the Title III program is considered concessinal, very little additional resources have been transferred to developing countries.

Consequently, with the prospect of a declining real level of assistance, the United States should target its aid in areas of the highest return on the funds it makes available. Assistance to agricultural research, technology development, and institution building meets this requirement.

Figure B: Total AID Expenditure on Rural Assistance and Assistance to Production Agriculture, 1969/73 & 1975/79 (millions of dollars at 1970 prices)



Based on AID/OFM Expenditure data adjusted for price change by the IBRD Index of International Inflation

Source: The Changing Content of U.S. Agricultural and Rural Development Assistance, Ray W. Nightingale, IED Working Paper, 1981

U.S. INTEREST IN THE WORLD FOOD PROBLEM

U.S. foreign assistance to agriculture has long been accepted as an important element in the conduct of foreign relations. The problems of hunger have continuously been emphasized by AID. In 1979, the Presidential Commission on World Hunger urged that addressing this problem be the central thrust of U.S. foreign policy, for the effectiveness it would have in expressing U.S. humanitarian concern and in contributing to political stability around the world. However, there are immediate U.S. economic interests which are served by agriculture and food assistance.

Don Paarlberg recently pointed out that, "experience has demonstrated that supply creates demand for food, and the great amount of genuine economic growth that can be generated in foreign lands will simply create more and stronger markets for the United States" (20). The introduction of preferred foodgrains into developing country markets has consistently resulted in a growing demand for these grains and an accompanying introduction of new wheat or rice based food items, or adaptation of traditional food preparations to the newly available grains. In most developing countries there is an income level-related distinction in household grain consumption. With general growth in income levels, consumption shifts from root crops or coarse grains to wheat, rice, and livestock products. Coarse grains are increasingly used as livestock feed. Thus, with greater availability of improved grains and resultant changes in relative prices, the demand for grains, in all their uses, rapidly expands.

In countries with large numbers of nearly subsistance farmers, increased production results directly in increased consumption by the farm families as they are able to market a lesser share of production. Also, consumption is increased in the households of agricultural laborers paid in kind. In both cases, this reflects a high elasticity of demand for foodgrains among lower income rural people.

In a more commercialized developing country agriculture, payments going to resources employed in increasing production generate income increases which result in increased demand for a broad spectrum of agricultural products, from grains to meats.

Agricultural growth in the Third World is a prerequisite for general economic growth and participation in international trade. It is these economies that currently provide the best prospects for economic growth and for increased demand for agricultural imports. Between the early 1960's and the mid-1970's increases in staple food production averaged 58 percent in the 16 developing countries experiencing most rapid growth in agriculture. During the same period these countries increased net imports of food 133 percent. The prospects are thus very good for countries which are now being assisted to improve their agriculture and to make the transition from aid recipients to trading partners (12).

Failure to increase food production to meet rising demand has placed a great burden on developing countries' generally scarce

supplies of foreign exchange. These exchange reserves are critically important for the purchase of a wide range of capital inputs needed to modernize their agriculture, industry, communications, and transportation. Many of these inputs are supplied by the United States. The advancement of agricultural production in these countries thus has a broad impact on U.S. trade prospects. Alternatively, continued agricultural production shortfalls can cancel economic development gains, increase political instability and erode international security.

RECOMMENDATIONS

In view of the preceding analysis of the evolving world food situation, development assistance needs, development assistance effectiveness, and recent and likely trends in development assistance funding the following specific recommendations for agricultural production improvement programs emerge:

1. The United States should continue and expand its assistance to the development of agriculture in developing countries, especially as the total real level of development assistance funding declines.
2. To be most effective, bilateral assistance should be concentrated on national agricultural research, technology development, transfer and adaptation, and institution building. This implies the support of viable local research institutions and the design and emplacement of the institutional network

to link research capacity to agricultural policymaking, on farm technical needs, training, and extension.

3. The United States should support the growth of foreign national education capacity in agricultural sciences to provide scientific manpower for establishment and maintenance of critical mass of scientists for effective research.
4. There must be increased collaboration between U.S. and international agricultural research establishments, particularly in exchange of personnel and methods.
5. The USDA-Land Grant system needs to be encouraged and supported to maintain a broadly based pool of experts available for service abroad either in national or international agricultural research establishments.
6. The United States should continue to fund international agricultural development assistance agencies, and specifically international agricultural research institutions.
7. U.S. technical assistance programs in agriculture should be coordinated and carried out in collaboration with international development banks which mobilize financing and provide investments in capital intensive and infrastructure projects. The two activities are highly complementary.

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